



Pulpal and periradicular diagnosis

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Purpose

In the fall of 2003, a new Glossary of Endodontic Terms¹ was published by the American Association of Endodontists. In August of 2004, a Clinical Update² was published to inform clinicians of revised terminology for endodontic diagnosis. The purpose of this Clinical Update is to inform clinicians of further revisions to this terminology.

The significant changes are primarily in the classification of chronic periradicular periodontitis with symptoms. This term has been eliminated and is now considered historical.

It is critically important to have standard diagnostic terminology because of the wide variety of training backgrounds of military dental officers and contract dentists. Standardization of terms will improve communication between all clinicians.

Diagnostic procedures

Diagnosis is defined as "the art of distinguishing one disease from another."³ Diagnostic procedures should follow a consistent and logical order and include review of medical and dental histories, radiographic examination and clinical examination. The clinical examination consists of extraoral and intraoral evaluations and diagnostic tests.⁴⁻⁹ During examination procedures, assessment and reproduction of the patient's chief complaint are imperative. The results should culminate in a two-part endodontic diagnosis that includes both a **pulpal** and a **periradicular** diagnosis.

Pulpal diagnoses

Normal pulp. A normal pulp is symptom free and will normally be responsive to the electric pulp tester (EPT). When evaluated by thermal testing, the normal pulp produces a positive response that is mild and subsides immediately when the stimulus is removed.

Reversible pulpitis. Caries, cracks, restorative procedures or trauma may cause a pulp to become inflamed. The patient's chief complaint is usually of an exaggerated response to thermal stimulus but once the stimulus is removed, the discomfort does not linger. EPT results are responsive.

Irreversible pulpitis. If the inflammatory process progresses, irreversible pulpitis can develop. Patients may have a history of spontaneous pain and complain of an exaggerated response to hot or cold that lingers after the stimulus is removed. EPT results are usually responsive. The involved tooth will often present with a history of an extensive restoration and/or caries.

In certain cases of irreversible pulpitis, the patient may arrive at the dental clinic sipping a glass of ice water or applying ice to the affected area. In these cases, cold actually alleviates the patient's pain as the dental pulp has developed allodynia and is hyperalgesic. Normal body temperature is now causing the nociceptors in the pulp to discharge.¹⁰ Removal of the cold causes return of symptoms and can be used as a diagnostic test.

Irreversible pulpitis can also present as an asymptomatic condition. Internal resorption and hyperplastic pulpitis (pulp polyp) are examples of asymptomatic irreversible pulpitis.

Pulpal necrosis. Necrosis is a histologic term that denotes death of the pulp. Teeth with total pulpal necrosis are usually asymptomatic unless inflammation has progressed to the periradicular tissues. The pulp will not respond to the EPT and if using a digital EPT, this result should be reported as no response (NR) over 80. The pulp will not respond to thermal tests. The dental record entry for this pulpal diagnosis should be pulpal necrosis.

Pulpless tooth. A tooth from which the pulp has been removed. For example, a tooth with previous pulpotomy/pulpectomy/root canal debridement or previous root canal therapy should be recorded as a pulpless tooth for the pulpal diagnosis.

Periradicular diagnoses

Normal Periradicular Tissues. Normal periradicular tissues will be non-sensitive to percussion and palpation testing. Radiographically, periradicular tissues are normal with an intact lamina dura and a uniform periodontal ligament (PDL) space.

Acute periradicular periodontitis. Acute periradicular periodontitis occurs when pulpal disease extends into the surrounding periradicular tissues and causes inflammation. However, acute periradicular periodontitis may also occur as the result of occlusal traumatism. The patient will generally complain of discomfort to biting or chewing. Sensitivity to percussion is a hallmark diagnostic test result of acute periradicular periodontitis. Palpation testing may or may not produce a sensitive response. The PDL space may appear normal, widened, or there may be a distinct radiolucency.

Acute periradicular abscess. In this situation, bacteria have progressed into the periradicular tissues and the patient's immune response cannot defend against the invasion. It is characterized by rapid onset, spontaneous pain, pus formation, and often swelling of the associated tissues. Depending upon the location of the apices of the tooth and muscle attachments, a swelling will usually develop in the buccal vestibule, on the lingual/palatal, or as a fascial space infection. Percussion testing produces a response that is usually exquisitely sensitive. This exaggerated response can help differentiate between acute periradicular periodontitis and the ear-

ly stages of acute periradicular abscess. Palpation testing produces a sensitive response. Radiographically, the PDL space may be normal, slightly widened, or demonstrate a distinct radiolucency. This periradicular pathosis can occur with a necrotic pulp or a pulpless tooth that has been partially or definitely endodontically treated if continued bacterial contamination and/or leakage occurs.

Chronic periradicular periodontitis. When bacteria or bacterial products from a necrotic pulp or pulpless tooth slowly ingress into the periradicular tissues, the patient's immune system may become involved in a chronic conflict. The resultant inflammatory process causes periradicular bone resorption that manifests as a periradicular radiolucency on the radiograph. Clinically, the patient is asymptomatic. Percussion and palpation testing produce non-sensitive responses.

Subacute periradicular periodontitis (chronic periradicular periodontitis with symptoms). The patient will present with mild to moderate symptoms that may include spontaneous pain or discomfort on biting or chewing. The tooth may present with any pulpal diagnosis. Percussion testing produces a mild sensitive response and palpation testing may or may not be sensitive. Clinical symptoms are not as severe as acute periradicular periodontitis. Radiographically, the tooth will present anywhere from a normal periradicular appearance to a distinct radiolucency. These patients must receive endodontic treatment in a timely manner because the condition can quickly progress into acute periradicular periodontitis or an acute periradicular abscess.

Chronic periradicular abscess (suppurative periradicular periodontitis). An inflammatory reaction to pulpal infection and necrosis characterized by gradual onset, little or no discomfort and intermittent discharge of pus through an associated sinus tract. Clinically, the patient is usually asymptomatic because the sinus tract allows drainage of any exudate from the periradicular tissues. EPT and thermal testing are non-responsive. Percussion and palpation testing usually produce non-sensitive responses. Radiographically, a periradicular lesion is associated with the involved tooth. This entity can also occur with a pulpless tooth that has been partially or definitely endodontically treated if continued bacterial contamination and/or leakage occurs.

Focal sclerosing osteomyelitis (condensing osteitis). This entity may be considered a true lesion of endodontic origin (LEO). The involved tooth will have an etiologic factor for low-grade, chronic inflammation such as a necrotic pulp, extensive restorative history or a crack. The patient may be asymptomatic or demonstrate a wide range of pulpal symptoms. EPT and thermal tests may or may not be responsive. Percussion and palpation testing may or may not be sensitive. Radiographically, the involved tooth will present with increased radiodensity and opacity around one or more of the roots. Evidence supporting consideration as a LEO is that 85% of these periradicular radiodensities resolve after endodontic therapy if they have a pulpal diagnosis of irreversible pulpitis.¹¹

Focal osteopetrosis (periapical osteosclerosis). This entity is not a LEO. The patient will be asymptomatic. EPT and thermal testing are responsive and normal. Percussion and palpation testing will typically be non-sensitive. The involved tooth

is usually a virgin tooth or has a normal pulp. Radiographically, the tooth will present with increased radiodensity and opacity around one or more of the roots. No treatment is necessary and the tooth should simply be monitored at periodic recall.⁸

Summary

Determination of the etiology of the patient's chief complaint and a correct diagnosis are paramount prior to a recommendation of endodontic therapy. Reproduction of the patient's chief complaint is critical. If the chief complaint cannot be reproduced, consider consultation with or referral to an endodontist or orofacial pain specialist.

The diagnostic terminology presented in this Clinical Update and summarized in the table that follows provides for a more accurate description and communication of the health or pathological conditions of both pulpal and periradicular tissues.

References

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The opinions or assertions contained in this article are the private ones of the authors and are not to be construed as official or reflecting the views of the Department of the Navy.

PULPAL AND PERIRADICULAR DIAGNOSES

<i>Pulpal Diagnosis</i>	Chief Complaint	History	Radiographic Findings	EPT	Thermal Testing	Percussion	Palpation	Mobility	Other
Normal Pulp	None		Normal	R	R, NL				
Reversible Pulpitis	Hot &/or Cold Sensitivity		Normal	R	Exaggerated, NL				Caries, Cracks, Restorative Procedures, or Trauma
Irreversible Pulpitis	Lingering Hot & / or Cold Sensitivity	Spontaneous Pain	Normal, PRL, or Widened PDL	R	Exaggerated, L				
Necrotic Pulp		Variable	Normal, PRL, or Widened PDL	NR	NR				
Pulpless Tooth		Previous Pulpotomy / Pulpectomy / RCT	Normal, Widened PDL, Or PRL	NR	NR				
<i>Periradicular Diagnosis</i>	Chief Complaint	History	Radiographic Findings	EPT	Thermal Testing	Percussion	Palpation	Mobility	Other
Normal Periradicular Tissues	None		Normal	R	R, NL	NS	NS	WNL	
Acute Periradicular Periodontitis	Discomfort When Biting or Chewing	Recent Restoration?	Normal, Widened PDL or PRL	R / NR	Variable	Moderately S	S or NS	+ / -	Occlusal Traumatism?
Acute Periradicular Abscess	Pain with possible Slight to Large Swelling	Coronal Microleakage?	Normal, Widened PDL or PRL	NR	NR	Exquisitely S	S	+ / -	Necrotic or Pulpless
Chronic Periradicular Periodontitis	None	Asymptomatic	PRL	NR	NR	NS	NS	WNL	Necrotic or Pulpless
Subacute Periradicular Periodontitis	Spontaneous or Discomfort When Biting / Chewing	Coronal Microleakage?	Normal, Widened PDL or PRL	R/NR	Variable	Mildly S	S or NS	+ / -	Occlusal Traumatism?
Chronic Periradicular Abscess (Suppurative Periradicular Periodontitis)	Bad Taste or "Gum Bump"	Asymptomatic	PRL	NR	NR	NS	NS	WNL	Necrotic or Pulpless with <u>Sinus Tract</u>
Focal Sclerosing Osteomyelitis (Condensing Osteitis)	Asymptomatic or Variable Pulpal Symptoms	Extensive Restorative History / Crack	Increased Radiodensity / Opacity	R / NR	Variable	S or NS	S or NS	WNL	
Focal Osteopetrosis / Periapical Osteosclerosis	Asymptomatic	Virgin Tooth or Normal Pulp	Increased Radiodensity / Opacity	R	R, NL	NS	NS	WNL	

WNL = Within Normal Limits L = Lingering NL = Non-lingering S = Sensitive NS = Non-sensitive R = Responsive NR = Non-responsive
PRL = Periradicular Radiolucency